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Expanded Trip Report:

Defense Scientific and Technical Information Applied to National Needs: Contributions from the DoD Information Analysis Centers Program

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1 Introduction and Summary

The Technology 2003 symposium was held from December 7 through 9, 1993, at the Anaheim Convention Center, Anaheim, California. This meeting was sponsored by NASA, NASA Tech Briefs, and by the Technology Utilization Foundation. This report summarizes elements of this meeting of interest to the IAC program in general and IRIA in particular.

Technology 2003, held at the Anaheim Convention Center in California from December 7-9, 1993, was a conference and trade show aimed at putting the leading technology developers and tech transfer experts in U.S. Federal laboratories, industry, and universities in direct contact with members of the business and scientific communities who could benefit from the knowledge and expertise available from these sources. To enhance the benefit from this event, the Conference on Defense Scientific and Technical Information Applied to National Needs, sponsored by the DoD IAC program of DTIC, was held at a nearby site during the same time period.

As a participant in the IAC conference, the IRIA Center was able to review and assess the Technology 2003 program with respect to its relevance to the DoD IAC program and the infrared and electro-optical community served by IRIA. This report summarizes our assessment of Tech2003 from this perspective.

2 Technology 2003 Program

The general message of Tech2003 was to alert business, industry, and academia to the general nature and broad extent of technology generally available for exploitation. In addition, the processes of technology transfer and the opportunities for developing joint ventures with other organizations were presented. Individual attendees will also follow up on the presentation of specific new developments of direct immediate interest to them.

Covering the wide range of science and technology in which the organizations contributing to the Tech2003 program are active, Tech2003 was certain to offer substantial amounts of technical

1

information in almost any selected business or industry area. This information was presented in a variety of forms, including workshops, symposia on selected subjects, industry media briefings, technical literature, exhibits, and direct one-on-one contacts between representatives of participating organizations and attendees. In particular, the program featured the adaptation of new technology developments to dual use applications and offered a means of opening up opportunities for joint ventures. Also, attendees should have gone away with an understanding of the mechanisms for accessing the variety of information sources available to them.

To the extent that attendees visited both Technology 2003 and the DTIC Conference, they would have been better able to appreciate the benefits potentially available from the DoD IAC program.

2.1 The Technology Transfer Process

Presentations were given that afforded the attendees insight into the technology transfer process and into ways of taking advantage of marketing opportunities for resulting new products. The program included the following:

Workshops were presented on:
- Defense conversion; Technology Reinvestment.
- Tapping into the Government's Technology Bank
- International Technology Transfer
- Marketing to the Federal Government.
- Industry/Media Briefings

Of particular interest were briefings on technology transfer from defense agencies, defense conversion, and telecommunications. Selected sessions are summarized and evaluated below.

2.2 Plenary sessions

2.2.1 "Defense Conversion and Technology Reinvestment: New Opportunities for Industry"

2

Daniel Goldwin, NASA administrator welcomed the attendees. He was followed by the keynote address given by Congressman George Brown (CA). Following the keynote, a panel discussion was held. Panel members from NASA, ARPA, and the Department of Commerce were present.

2.2.2 "How to Successfully Tap into the Government's Technology Bank "
Experts from NASA, DoD, DoE, and other federal agencies demonstrate ways to access technology developed under the aegis of the federal government. CRDA's, SBIR's, and TRP's are discussed.

2.3 Concurrent sessions

Concurrent symposia and workshops were held on all three days of the symposium. Reviews are organized by session title. This section summarizes those offerings in the overall program that we believe would be of special interest to the IR/EO community. The topics listed are sufficiently specific in nature that they could directly address a potential user's problems or opportunities and be likely to result in direct follow up by the attendee.

2.3.1 Artificial intelligence

<u>Advances in Neural Network Pattern Recognition (NSWC)</u> An important element in the design of infrared systems is the ability to quantify discrimination in man-in-the-loop and machine vision systems alike. Neural networks are an approach to this.

<u>New Approaches for Real-Time Decision Support Systems (NSWC)</u> This presentation reviews Navy research into new computational tools to support time-critical decision processes.

2.3.2 Biotechnology

<u>Dual Use of Image-Based Tracking Techniques: Laser Eye Surgery and Low Vision Prosthesis</u> The application of image tracking technology to medical situations is discussed. Of particular interest is the use of lasers for photocoagulation, and the use of image warping for certain forms of human visual abberation.

<u>Medical Imaging Using Cooled Optically-Stimulated Luminescence</u>   Laser-addressable
storage phosphors show promise for medical imaging, since they can be readily
molded into sheets.

2.3.3   Environmental technology

<u>Seed Viability Detection Using Computerized False-Color Radiographic Image
Enhancement</u> The utility of false color techniques to enhance the detection of seed
viability is discussed here. False color is a visualization tool of general utility.

2.3.4   Materials science

<u>Deposition of Tantalum Carbide Coatings on Graphite by Laser Interactions</u>   The use of
laser in manufacturing processes is described here.

<u>Development of a Unique Polyurethane Primer/Topcoat</u> The coating process described
here purports to offer excellent protection, flexibility, adhesion, and resistance to
chemical attack. The optical properties of the coating were not reviewed, however.

2.3.5   Photonics

<u>Optical Processing / Scanning Defect Mapping for Semiconductor Device Fabrication</u>
This presentation reviewed two new devices with potential used in the production of
optical components and related activities.

<u>Neutral Ion Sources in Precision Manufacturing</u> The use of ion polishing in figuring
optical surfaces was discussed. This non-contact approach mitigates some traditional
problems such as edge turning.

<u>High-power Diode Lasers for Solid-State Laser Pumps</u> This talk reviewed the
development of 780-830 nm diode lasers. These lasers may be used to pump more
coherent lasers, such as Nd:YAG. The latter class of solid state lasers play a key role
in laser rangefinding and designation.

<u>Flexible Manufacturing for Photonics Device Assembly</u>   Machine vision, robotics, and
multi-axis stages are use to align and attach optical fibers to an optical waveguide.

2.3.6   Test and measurement

<u>An Acousto-Optical Tunable Filter Based Near-infrared Spectrometer for Analysis of
Gasolines and Diesel Fuels</u> This presentation describes a portable spectrophotometer

4

which may be used to measure properties of fuels, such as octane, aromatic content, and other characteristics.

A Versatile Nondestructive Evaluation Imaging Workstation This talk described a PC based C-scan and eddy current imaging workstation.

A New High Speed IR Camera System This camera uses a 128 x 128 focal plane array sensitive in the mid- to long-wave infrared, clocked at 1000Hz frame rate. This device holds promise for industrial and machine vision applications.

2.3.7   Computer aided design and engineering

Analytical Design Package-ADP2: A Computer-aided Engineering Tools for Aircraft Transparency Design This integrated package is used to assist in the design of aircraft transparencies, such as canopies, windows, and sensor ports. This package addresses structural considerations, as well as optical and thermal issues.

2.3.8   Video / imaging

Mapping, Analysis, and Planning System This talk reviews an environmental management, impact assessment, and monitoring system. Databases provide information through digital imagery, video, audio, and hypertext.

Remote Sensing for Urban Planning and Disaster Assessment NASA's Calibrated Airborne Multispectral Scanner has been used to conduct urban change analysis and to predict the utility of underdeveloped land.

Remote Sensing and the MS High-Accuracy Reference Network The High Accuracy Reference Network (HARN) is used for geodetic control of monitoring activities, and has been combined with NASA remote sensing technology to accumulate geographic information.

Visually Optimized DCT Image Compression Two compression techniques were discussed for use to reduce the size of digital images.

The Trustworthy Digital Camera: Restoring Credibility to the Photographic Image This discussion reviews a technique to prevent unknown tampering with digital images.

2.3.9   Information management

High-speed Data Search This presentation describes a high speed text retrieval system which provides for ranking of retrieved documents, capability for natural language input; relevance feedback, and semantics.

Database Tomography for Commercial Application This talks reviews an approach for full text indexing of databases.

2.3.10   Power and energy

Fiber-Optic Solar Simulator "FOSS" produces an output beam that simulates the solar spectrum by mixing filtered light beams in a fiber optic cable.

2.3.11   Advanced manufacturing

Precision and Manufacturing at Lawrence Livermore National Laboratory Specific topics included diamond turning of optics, precision machine tooling, and other innovations.

2.3.12   Program-IAC cross reference

3   Exhibits

3.1 Review of the U.S. Government's Technology Information Sources

The Tech2003 program makes clear the current emphasis on technology transfer by DoD agencies, other government agencies, industrial companies, and organizations specializing in technology transfer.

The Tech2003 official program indicates that a large number of government agencies, both DoD and non-DoD, are sponsoring work that the IACs should be aware of, both in fulfilling their current DoD oriented missions and for the extension of their activities to the current trends in technology transfer to business and industry, including the promotion of dual use technology. DoD agencies involved in presenting symposia, providing exhibits, and disseminating technical literature included strong representation from the three armed services, as well as BMDO and other agencies working out of OSD. Outside the DoD, there was representation from the Departments of Commerce, Energy, Agriculture, NASA, the Federal Aviation Administration, Federal Highway Administration, and other government agencies.

6

The program at Tech2003 displayed the vast array of information resources available to American engineering, scientific, and managerial personnel. In order to document this widely distributed body of knowledge to meet the detailed needs of the technology transfer community, the Directory of Federal Laboratory & Technology Resources, 5th edition, October 1993 has recently been published for NTIS by the National Technology Transfer Center, Wheeling, WV 26003.

3.2 Review of DoD Technology Information Sources

Major current interest among defense industries centers on possibilities for defense conversion. Topics related to this interest noted in the exhibits include technology spin-off and commercialization, defense conversion, new products available for licensing, test and analysis facilities, technical information sources and access, computer modeling and simulation, and space research.

The direct contact at Tech2003 between agency representatives and attendees was helpful both in making the attendees aware of the availability of information on problems of immediate concern to them and in alerting them to the general availability of the same resources for investigating future technical problems or looking for new business opportunities. This second objective will have the most enduring benefits and is the one the IACs should be reviewing in their long-term planning.

Technical literature available from DoD agencies provided much detailed information on their capabilities. Examples from this literature of DoD agencies that are actively and substantially engaged in promoting technology transfer include the following:

3.2.1   BMDO.

The mission of the BMDO Office of Technology Applications offers guidance to American businesses in the use of new technology, much of it derived from past or current SDIO/BMDO programs. Its Technology Applications Report describes an impressive number of technical developments in which it has been involved. These include IR/EO related developments adaptable

to such areas as medical imaging, 3-dimensional image processing, environmental modeling with remote sensing tools, solar cells, miniature sensors, high definition TV screens, scene projection, optical data storage, expert system software, integrated circuit fabrication, laser communications, and adaptive optics.

3.2.2   TECOM.

An overview was provided on the Army Test and Evaluation Command's extensive test facilities and responsibilities for military platforms and weapon systems, as well as non-DoD activities in industry testing, environmental programs (wildlife habitat restoration, waste disposal technologies), and international testing,

3.2.3   Army Research Laboratory.

ARL was recently created out of seven laboratories which constituted the U.S. Army Laboratory Command, as well as select elements of other U.S. Army technology base entities. It states its primary responsibilities as research and technology development and independent analysis of weapons system performance in the areas of survivability and lethality, human factors, and battlefield environmental effects. ARL also offers its technology resources to the civilian sector through its Domestic Technology Transfer Program. Private businesses, state and local governments, and academia can use ARL's expertise and facilities to enhance their internal R&D efforts. Of primary interest to IR/EO personnel are its work in laser and electro-optics technology, autonomous systems for ground vehicles, aircraft collision avoidance, and gaseous detection.

3.2.4   Air Force Phillips Laboratory

Programs in lasers and imaging, space and missile technology, and geophysics involve many aspects of IR/EO technology.

3.2.5   Naval Air Warfare Center, Aircraft Division, Patuxent River.

The extensive test facilities at this location are described in detail. This organization, formerly known as the Naval Air Test Center, has gathered together the bulk of Naval Aviation's operational test and evaluation facililties at this location.

3.3 Non-DoD Federal Sources of Information

3.3.1 Sandia National Labs.

"A Guide to Sandia Programs" lists its range of programs and identifies points of contact. The program areas that related to IR/EO include superconductivity, robotics, command and control, microelectronics and photonics, remote sensing and verification, precision strike systems, computational simulation, ASIC products, opto-electronics, guidance and control, synthetic aperture radars, defense program technology transfer. The LAZAP facility at Kirtland AFB, NM, consisting of a large Cassegrain beam director/telescope, several high power lasers, and control, tracking and safety equipment is available for on-orbit testing and calibration of electro-optic sensors.

3.3.2 NASA

The National Aeronautics and Space Agency played the lead role in the organization of this conference. Their large exhibit demonstrated an extensive array of technologies for potential transfer to civilian applications.

3.4 Industrial Exhibitors

Many of the exhibits featured specific types of components and systems used in infrared and electro-optical manufacture and test, including optical, laser, electronic, and computer hardware and software.

3.4.1 Mathematical emulation exhibits

IRIA is currently developing a computer compatible version of the Infrared and Electro-optical Systems Handbook. The mathematical scripting language, Mathcad, is being used as the host for this product. While Mathcad is suitable for this application, other mathematical products may

provide alternative platforms for the handbook. Several firms were contacted during TT 2003 to ascertain the potential for doing this. These interactions are described below.

3.4.1.1 Macsyma

Macsyma, produced by Macsyma, Inc., is a broad based mathematical emulator which includes a wide variety of mathematical functions and procedures. It is available on PC's, UNIX systems, and other platforms. While the overall capabilities of Macsyma are impressive, its document organizing features appear inferior to those of Mathcad. For this reason it is less desirable.

3.4.1.2 IDL

IDL (produced by Research Systems, Inc.) is a high-end mathematical programming language which is capable of a wide range of mathematical and information visualization techniques. It appears intended for application to large scale simulation or data analysis tasks; its high cost make it uneconomical to use as a Handbook vehicle.

4 Technology Transfer in The DoD IAC Program

4.1 Requirements for Successful Technology Transfer

The general message of Technology 2003 was to alert business, industry, and academia to the general nature and broad extent of technology generally available for exploitation. However, as a continuing source of assistance in facilitating technology transfer for the general user, mechanisms are needed to make the technology transfer process a continuing and steady effort.

Some of these mechanisms are already in successful operation. For organizations with the necessary security clearance, DTIC's operations offer a way to obtain technical information. Also, NTIS and NASA are examples of agencies that offer bibliographic services which are not restricted by security limitations.

For many users, however, particularly smaller companies with limited resources, special assistance will be required to enable them to take advantage of the vast array of available resources.

10

The overall problem of accomplishing effective technology transfer requires successfully addressing two distinct but related tasks. Tech2003 and the IAC conference held in conjunction with it was a major effort at the task of publicizing the wide availability of technical information resources and the range of organizations prepared to help the user identify and acquire the information needed to address a specific goal. The second critical task is that involved in the actual identification and delivery of the needed information.

4.2 Meeting User Needs

In dealing with users, the task is to make available to the user the needed guidance and technical information in a manner that is geared to his or her background. The IAC staff member should be able to talk technology at whatever level the user is comfortable with, to understand and possibly reinterpret the user's problem on short notice, and to avoid loading the user (at least initially) with more of the technology transfer process than he needs to accomplish his goal.

The problem of dealing with the user on his own terms is most urgent when working with small businesses, which may have only limited capabilities in searching for and absorbing technical information. Employees of larger companies are better equipped and have more organizational resources to handle some of the complexities of information transfer, but even here there will be many cases where the IAC staff can simplify and improve the technical contact. This is particularly true when dealing with employees of large organizations who have had little previous experience with information availability and information search procedures.

4.3 Role of the DoD IAC Program

The DoD IACs are specially qualified to serve as a go-between from the user to the information resource. Each one is in existence because it has an area of expertise in which it has specialized. The entire DoD IAC program broadens this coverage to touch almost all fields of DoD technology.

Although the DoD IAC program is inherently well suited to performing these tasks, it needs to have a carefully constructed plan and appropriate procedures designed to meet the user's needs. The IAC program has access to a massive technology resource base which consists essentially of all DoD technology, much of which is today's cutting edge technology. The basic job to be accomplished is to match the technology with the user's problem. This requires the IAC not only to understand the technology, but to understand both the requirements and limitations of the user.

Each of the IACs has large amounts of information at its disposal, including its own internal databases, libraries, and personnel, and outside sources, particularly the information resources of DTIC and DoD agencies, and close and continuing contacts with DoD agency and contractor personnel. Two major requirements must be fulfilled to make best use of these resources: (1) the IAC staff must become as familiar as possible with the individual resources, and (2) the IACs must work together by calling on other IACs that are cognizant of a particular problem.

The IACs are therefore in an excellent position to offer technical support to business and industry on its own terms. The IAC staff member can talk to the user in the user's language and pick up rapidly on understanding his problem. At the same time, the IAC staff will have a broad overview of the information resources applicable to the problem. If some analysis of the problem is required, the staff member is also in a favorable position. (If the staff member cannot perform these functions directly, the inquiry can usually be referred to someone who can. In some cases, this referral may be to another IAC closer to the user's interests.)

The above characteristics of a well-functioning IAC can be summarized under the heading of user friendliness. The user should be able to depend on the IAC for a clearly defined recommendation of available information carried far enough that the user's attention can be limited to the technical aspects of the problem.

Two specific suggestions are offered here for enhancing the natural advantages of the DoD IACs.

- General discussions might be held within the DoD IAC program to compare experiences with the technology transfer process and the effectiveness of specific procedures.

- Possible additions to the user's guide literature available from the DoD IAC program should be considered. The currently published guide to the individual IACs performs much of the required function. It might be supplemented by such items as a unified subject index covering the technical know-how of all the IACs, general articles on DTIC products and services, or general information on other information sources. This documented material can also be useful to the IAC staff itself.

5 Suggestions for Future Meetings

Based on our experience with the first such meeting with which the DoD IAC program was associated, it is possible to suggest some ideas which may improve the usefulness of future meetings following Tech2003.

- A single document could be prepared and supplied to the individual attendees which would serve as a comprehensive and organized reference source document to be retained by the attendee. The document would list such information as the names of the participating organizations, points of contact with address and phone number, and major subject areas, activities and facilities available from the organization. This could be a condensation of the material included in the 5th edition of the Directory of Federal Laboratory & Technology Resources.

- Technically oriented papers would be included in the reference document giving practical guidance and advice on the best procedures for accomplishing the functions promoted by the conference: technology transfer procedures, joint ventures, test facilities, etc. If the topic has been presented at a symposium, these papers might be reprints of the material presented.

- Small scale spin-offs of the meeting might be held at the same time and place as the meeting of a major professional society or trade group, and oriented toward the interests of that audience. More generally, bringing the meeting to the user would generate more interest and more traffic.